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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/742,306	12/19/2003	Chng Han Shen	APS03-003	5693

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EXAMINER

IM, JUNGHWA M

ART UNIT	PAPER NUMBER
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2811

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/742,306

Applicant(s)

SHEN ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 29, 2006 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 13-21, 24-33 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez (US 6732913) in view of Hikita et al. (US 6965166), hereinafter Hikita.

Regarding claim 1, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 415] formed over the single substrate;

each of the two or more bump structures having a solder line; and

an epoxy layer [410] formed over the single substrate; the epoxy layer having a top surface.

Fig. 4E of Alvarez shows most aspect of the instant invention except “two or more various shaped bump structures.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures to reduce the misalignment problem.

Regarding claim 2, Fig. 1 of Hikida shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Regarding claim 13, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 410] formed over the single substrate;

each of the two or more various shaped bump structures having a solder line; and

an epoxy layer [410] formed over the single substrate; the epoxy layer having a top surface .

Fig. 4E of Alvarez shows most aspect of the instant invention except “two or more various shaped structures having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14] having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures having a second height that is less than the first height to reduce the misalignment problem.

Regarding claim 25, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 410] formed over the single substrate;

each of the two or more bump structures having a solder line; and

an epoxy layer [410] formed over single the substrate; the epoxy layer having a top surface.

Fig. 4E of Alvarez shows most aspect of the instant invention except “the two or more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14] having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape to reduce the misalignment problem.

Regarding claims 3 and 14, Fig. 1 of Hikita shows that the two or more various shaped bump structures have a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.

Regarding claims 4, 15 and 27, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a bar shape except “a width of from about 40 to 300 um and a length of up to about 3000 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a bar shape with a width of from about 40 to 300 um and a length of up to about 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim

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are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 5, 16 and 28, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a round shape except “a diameter of from about 40 to 300 um.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a round shape with a diameter of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 6, 17 and 29, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a rectangular shape except “a width of from about 40 to 300 um and a length of from about 300 to 3000 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 40 to 300 um and a length of from about 300 to 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 7, 18 and 30, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a

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rectangular shape except “a width of from about 100 to 200 um and a length of from about 350 to 1200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 100 to 200 um and a length of from about 350 to 1200 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 8, 19 and 31, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 40 to 300 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a square shape with a width of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 9, 20 and 32, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 100 to 200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a

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square shape with a width of from about 100 to 200 μm to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10, 21 and 33, combination of Alvarez/Hikita shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a circular shape except “an outer diameter of from about 100 to 2500 μm .”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a circular shape with an outer diameter of from about 100 to 2500 μm to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 24, Fig. 1 of Hikita shows that the two or more various shaped bump structures have two sets of heights.

Regarding claim 26, Fig. 1 of Hikita shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Regarding claims 36-38, Fig. 4 of Alvarez shows that the solder lines are above the top surface of the epoxy layer.

Claims 12, 23 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez in view of Hikita as applied to claims 1, 13 and 25 above, and further in view of Yanagida (US 6204558).

Regarding claims 12, 23 and 35, combination of Alvarez/Hikita fails to show that the epoxy layer is comprised of thermosetting resin. Fig. 1C of Yanagida shows that the epoxy layer is comprised of thermosetting resin (col. 6, line 29-30).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Yanagida into the device of Alvarez/Hikita in order to have epoxy layer comprised of thermosetting resin to protect the bumps.

Claims 11, 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez in view of Hikita as applied to claims 1, 13 and 25 above, and further in view of Degani et al. (US 6734539), hereinafter Degani.

Regarding claim 22, the combined teachings of Alvarez and Hikita show most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square and/or rectangular shape, however, fail to show that at least one of the two or more various shaped bump structures is employed as an RF shield or a Faraday cage. Fig. 11 of Degani shows a bump structure [111] is employed as an RF shield or a Faraday cage (col. 7, lines 36-49).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Degani into the device of and Hikita in order to have at least one of the two or more various shaped bump structures employed as an RF shield or a Faraday cage to reduce the noise.

Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Douglas W. Owens 12/26/06

jmi

DOUGLAS W. OWENS
PRIMARY EXAMINER